## CLAIMS:

- [cl 1] A method for manufacturing methanol and acetic acid, characterized by the integrated steps of:
  - separating a hydrocarbon source into first and second hydrocarbon streams;
  - steam reforming the first hydrocarbon stream with steam to produce a reformed stream;
  - autothermal reforming of a mixture of the reformed stream and the second hydrocarbon stream with oxygen and carbon dioxide to produce a syngas stream;
  - separating a minor portion of the syngas stream into a carbon dioxiderich stream, a hydrogen-rich stream, and a carbon monoxide-rich stream;
  - recycling the carbon dioxide-rich stream to the autothermal reforming; compressing a remaining portion of the syngas stream, at least a portion of the hydrogen-rich stream to supply a makeup stream to a methanol synthesis loop to obtain a methanol product; and synthesizing acetic acid from at least a portion of the methanol product and the carbon monoxide-rich stream.
- [cl 2] The method of claim 1, wherein the makeup stream has an SN between 2.0 and 2.1.

[cl 3] The method of any one of the preceeding claims, further comprising supplying a purge gas stream from the methanol synthesis loop to the separation step.

- [cl 4] The method of any one of the preceding claims, wherein the autothermal reformer is a single train autothermal reformer.
- [cl 5] The method of any one of the preceeding claims, wherein the separation step includes supplying the minor portion of the syngas to a methane wash cold box unit.
- [cl 6] The method of claim 5, wherein a flash gas from the separation step is recycled to the methanol synthesis loop.
- [cl 7] The method of any one of claims 5 or 6, wherein a tail gas stream from the cold box is recycled as feed gas.
- [cl 8] The method of any one of the preceding claims, wherein carbon dioxide emissions are less than 10% of the total carbon input.
- [cl 9] The method of any one of claims 1-7, wherein carbon dioxide emissions are less than 5 percent of the total carbon input.
- [cl 10] The method of any one of the preceeding claims, wherein a first portion of the hydrogen-rich stream from the separation step is recycled to the methanol synthesis loop and a second portion is sent as feed to an associated process.

[cl 11] The method of any one of the preceeding claims, further comprising supplying a carbon dioxide stream from an associated process to supply the makeup stream.

- [cl 12] The method of any one of claims 10 or 11, wherein the associated process uses the acetic acid as a reactant, uses the methanol product as a reactant, shares oxygen from a common air separation unit, shares common utilities, or a combination thereof.
- [cl 13] The method of any one of claims 10-12, further comprising:

  providing at least a portion of the acetic acid produced to a vinyl acetate

  monomer synthesis loop in the associated process;

  combining the portion of the acetic acid with an ethylene source and

  oxygen to produce vinyl acetate monomer.
- [cl 14] The method of claim 13, wherein a single air separation unit supplies oxygen to the associated process and the autothermal reformer.
- [cl 15] The method of any one of the preceding claims, wherein at least 10% of the syngas stream is directed to the separation step.
- [cl 16] The method of any one of the preceding claims, wherein the methanol produced is between 1,000 and 30,000 tons/day.
- [cl 17] The method of any one of the preceeding claims, wherein the acetic acid produced is between 500 and 6,000 metric tons/day.
- [cl 18] The method of any preceding claim, further comprising importing a CO2-rich stream to the methanol synthesis loop.

[cl 19] The method of claim 13, further comprising importing a CO2-rich stream from the vinyl acetate monomer synthesis loop to the methanol synthesis loop.

- [cl 20] The method of claim 18 or 19, wherein the hydrocarbon source comprises natural gas and a ratio of the imported CO2 stream to the hydrocarbon source is at least 0.05 kg CO2 per Nm3 natural gas.
- [cl 21] The method of claim 20, wherein the ratio of the imported CO2 stream to the natural gas is at least 0.2 kg CO2 per Nm3 natural gas.
- [cl 22] The method of claim 19, wherein the ratio of the imported CO2 to the natural gas is at least 0.23 kg CO2 per Nm3 natural gas.
- [cl 23] The method of any one of the preceding claims, comprising:

  diverting between 35 and 65% of the feed gas stream to the first stream;

  and
  - diverting between 35 and 65% of the feed gas stream to the second stream.
- [cl 24] The method of any one of the preceding claims, comprising:

  diverting 45 to 55% of the feed gas stream to the first stream; and

  diverting 45 to 55% of the feed gas stream to the second stream.
- [cl 25] The method of any preceding claim wherein the separation step produces a tail gas stream enriched in inerts.